REMARKS

Claims 1-6, all the claims pending, stand rejected.

As a preliminary matter, Applicant gratefully note that the Examiner has found Applicant's arguments filed on August 17, 2006 to be persuasive. Thus, the rejection of all the claims based on Nagoshi et al. (6,234,901) has been withdrawn. However, the Examiner provides no comments in his Response to Arguments at page 8 of the Office Action but simply states that a new rejection is made, based on newly cited reference to Iwasaki (6,518,967) and Nagoshi et al, as discussed subsequently. Applicants submit that the claims are patentable over the combination of references, particularly on the basis of the distinctions over Iwasaki as explained subsequently. The Examiner is requested to give careful consideration of this explanation.

Claim Rejections - 35 U.S.C. § 103

Claims 1-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwasaki (6,518,967) in view of Nagoshi et al. (6,234,901). This rejection is traversed for at least the following reasons.

The present invention is expressly intended to facilitate the display of highlight features on an opaque object, where a processor has limited capability, such as a household game machine with microprocessor 14, as explained at pages 6 and 7 of the present application. In order to accomplish this result, the image of a highlight opaque object is (1) generated, (2) appropriately positioned, and (3) overlaid in parallel onto a main display object, as illustrated in Fig. 2. As illustrated in Fig. 4 and explained at page 8, the highlight object 52 may have a texture image, comprising color, transparent and semitransparent portions.

The structure and steps for accomplishing this result are set forth in independent apparatus claim 1, independent method claim 5 and independent program product claim 6. The limitations in these claims are similar.

Claim 1

The structure of independent claim 1, which defines the invention in terms of "means - plus- function" limitations, were previously analyzed on the basis of existing USPTO Guidelines for such limitations and are presented again below because of their relevance to the new reference to Iwasaki.

Claim 1 is directed to an image processing device for displaying an image representing an opaque object arranged in a virtual 3-dimensional space. The device is implemented as a system, as illustrated in Fig. 1, comprising a microprocessor 14, image processing unit 16 and display 18, which communicate via bus 12 with a main memory 26 and an I/O processing unit 30 that is connected to a variety of other I/O units. This structure is disclosed at pages 6 and 7. The operation of the image processing device is based upon software components in the main memory 26 and auxiliary storage 24 that are accessed by the microprocessor 14 and image processing unit 16. An explanation of the functions of the image processing device 10 is described at pages 10 and 11 with regard to the illustration in Fig. 8. The following are the recited means and their corresponding structures in claim 1:

Light Source Position Acquisition Means - the first element of claim 1 is the light source position acquisition means, which has the function of acquiring a light source position set in the virtual 3-dimensional space. As illustrated in Fig. 8, this unit 62 is coupled to two other calculation units. With reference to Fig. 2, the application explains at page 10 that the unit 62 acquires the **light source position LP** set in the virtual 3-dimensional space 50, where the position LP is either pre-stored or calculated when the light source is dynamic.

Viewpoint Position and Viewing Direction Acquisition Means - the viewpoint position and viewing direction acquisition means, which has the function of acquiring a viewpoint position and viewing direction set in the virtual 3-dimensional space, corresponds to unit 64 in Fig. 8. Unit 64 acquires the **viewpoint position VP** and the **viewing direction VD** set in the virtual 3-dimensional space 50, as illustrated in Fig. 2. The values of VP and VD may be stored or calculated when they are dynamic.

Highlight Position Calculation Means - the highlight position calculation means has the function of calculating a position of an image representing a highlight appearing on the surface of the object based upon the viewpoint position VP. As illustrated in Fig. 8, unit 66 corresponds to this means and receives an input from units 62 and 64. As explained at page 8, with respect to Fig. 5, the **highlight position HP** appearing on the surface of the soccer pitch object 54 may be based on the viewpoint position VP. Unit 66 may set the highlight position HP based on the viewpoint position VP and the viewing direction VD at a predetermined position ahead of the visual line. For example, it may be set at a position where the incident angle is equal to the reflection angle, as illustrated in Fig. 6. Notably, the highlight position (or point of reflection) HP is the position of the highlight calculated by the highlight position calculation means, and is different from the position of the light source acquired by light source position acquisition means.

Highlight Intensity Calculation Means - the highlight intensity calculation means has the function of calculating intensity of the highlight based on the light source position and viewing direction. As represented by unit 68 in Fig. 8, this unit receives inputs from units 62 and 64 and outputs a signal to unit 70, a semitransparent composition unit. As explained at page 11, unit 68 calculates the highlight intensity based on the light source position LP and the viewing direction VD, as illustrated in Fig. 2. The **"highlight intensity"** is defined as the semitransparent composition rate used for semitransparent composition of the texture image representing a highlight onto the texture image representing the soccer pitch, with reference to Fig. 2.

Semitransparent Composition Means - the semitransparent composition means has the function of performing semitransparent composition of the image representing the highlight onto the image representing the object based on the position calculated by the highlight position calculation means and a semitransparent composition rate corresponding to the intensity calculated by the highlight intensity calculation means.

As explained at page 11 with regard to the unit 70 illustrated in Fig. 8, this means performs semitransparent composition of the image 52 representing a highlight (Fig. 4) onto the image representing the soccer pitch 54 (Fig. 3) based on the highlight position HP calculated by

unit 66 and the composition rate corresponding to intensity, calculated by unit 68. As explained at page 8, the highlight object 52 is arranged at a highlight position HP set on the surface of the soccer pitch object 54 in parallel thereto. The texture image 52 shown in Fig. 4 is mapped onto object 54 and expresses the highlight appearing on the surface of the soccer pitch 54 with a circular image at the center and a peripheral region assigned transparent attributes. The circular image may have a color different from the texture image for expressing a highlight. The circular image may include a transparent or a semitransparent portion.

Iwasaki

The Examiner uses Iwasaki as the base reference. The Examiner notes at page 2 of the Office Action that Iwasaki discloses an image processing device for displaying an image representing an opaque object arranged in a virtual three-dimensional space, with reference to col. 4, lines 66-67 and col. 5, lines 1-14. The Examiner also notes that the game may be a race game with moving cars as objects (col. 5, lines 27-29), or any other game with a moving object in three-dimensional space that is constructed of polygons (col. 6, line 53-col. 8, line 25; col. 11, lines 40-43; Figs. 3 and 4). The Examiner further notes that a **reflection texture image** comprises an image of 256 x 256 dots, which may be superimposed in the form of a translucent image on a polygon of the moving object. The superimposed portion representing reflecting light from light sources that are present on the course traveled by the object car, with reference to col. 6, lines 39-43. As explained at col. 6, lines 9-52, data must be stored in RAM 22 for several parameters that comprise a displayed image, including car polygon data 50, a vertex-coordinate table 55, a **reflection flag table** 60, a vertex-**reflection** texture UV coordinate table 65, player car center position coordinate 70, UV offset data 75, a vertex screen coordinate table 80, and other data. The reflection texture image has periods of 128 dots in each of the U- and V-directions.

In the arrangement taught by Iwasaki, the image of an object car is generated with polygons on the basis of first data division 51, second data division 52, the latter including translucency attribute information and texture number as explained at col. 6, line 53-col. 7, line 40. As explained at col. 7, line 42, a **reflection flag table** 60 is used for each of the polygons

constituting an object car and specifies whether the polygon is one on which **reflection texture image** is to be pasted.

As explained beginning at col. 8, line 30, the polygon process is illustrated in Fig. 10 and the drawing process is illustrated in Fig. 11. In processing a polygon, following the calculation and storage of screen coordinates of each vertex of a processed polygon, a determination is made as to whether a processed polygon is a reflection polygon or not, by referencing the **reflection flag table** 60 in step 204. If a reflection polygon is processed (step S205), the control section 21 obtains coordinates of a point resulting from parallel projection of a vertex of the processed polygon onto the UV plane in step S206. The control section 21 also obtains a vector resulting from parallel projection of a normal vector at a vertex of interest, at a preset factor onto the UV plane in step S207. Then, in step 208, the control section 21 computes the texture UV coordinate values concerning the vertex under processing, based on the coordinates and vector obtained. The processing is completed vertex-by-vertex for all of the polygons (steps S210 and S211).

With reference to Fig. 11 and the disclosure at col. 9, line 25 - col. 11, line 24, the object car drawing process is conducted by control section 21 on a polygon-by-polygon basis and includes a determination as to whether the process polygon is a reflection polygon or not, by referencing the **reflection flag table** 60 in step S304. As explained at col. 9, lines 44-58, when a reflection polygon is processed (step S305), a copy of the second data concerning a processed polygon is generated and UV coordinate values for each vertex, translucency attribute information and the texture number (indicating the reflection texture image) are rewritten in the second data, in step S308. The control section then stores the second data for use in drawing. This complex process is conducted for all polygons.

As explained beginning at col. 10, line 46, with reference to step S307-309 in Fig. 11, and as schematically illustrated in Fig. 15, data to draw over the reflection polygon, a translucent polygon in which an area (hatched) of the reflection texture image, having the vertices as a result of the operations in steps S206-S209, are pasted. This is produced by making use of the screen coordinates in the second data concerning a reflection polygon.

An example of the use of car polygon data 50 and a **reflection flag table** 60 to generate an object is illustrated in Figs. 16A-16D, where the polygons for constructing the object are illustrated in Fig. 16A and a drawing of a graphic image based on second data divisions is illustrated in Fig. 16B. The drawing of a copy of an image, including reflection texture number translucency attribute and reflection texture UV coordinates, is illustrated in Fig. 16C. The drawing in Fig. 16C is made on a translucent basis. Thus, a translucent polygon on which part of the reflection texture image is pasted is superimposed on each portion designated as a reflection polygon, as schematically shown in Fig. 16D. The area of the reflection texture image used in the generation of translucent polygons is varied according to the player car centered position coordinates. Thus, as the car is moving in the direction of depth in which the viewpoint follows the position of the player cars displayed on the display screen, the display shows a pattern that moves opposite to the moving direction of the object car relative to the race course.

On the basis of the foregoing disclosure, the Examiner states at pages 2-3 that Iwasaki discloses a **highlight position calculation means** for calculating a position in the virtual three-dimensional space of an image representing a highlight caused by reflection of light from a light source appearing on a surface of the object based on a viewpoint position, with reference to col. 7, lines 10-21. <u>However, the Examiner expressly admits at page 3 of the Office Action that Iwasaki does not disclose the following five express limitations in claim 1:</u>

- A **light source position acquisition means**;
- A **viewpoint position and viewing direction acquisition means**;
- A **highlight intensity calculation means**;
- A **semitransparent composition means**; and
- **An image display means** for displaying an image obtained by performing semitransparent composition of an image representing a highlight onto an image representing the opaque object by the semitransparent composition means.

Nagoshi et al.

The Examiner turns to Nagoshi et al. for the five missing limitations. However, as demonstrated subsequently, the teachings of Nagoshi et al (1) are incompatible with the system of Iwasaki because of substantially different processing of the images, and (2) even if combined, are so complex that they would not teach the simple approach of the present invention.

Nagoshi et al discloses a video block 11 in Fig. 1 having a video display processor 120, which performs drawing of objects comprised of polygon data in a video game. It also illustrates a video display processor 130, which performs the drawing of background pictures, synthesis of polygon picture data with the background pictures and clipping processing, with reference to col. 6, lines 1-7. Nagoshi et al. controls the overall operation of the device with a main CPU 101 for executing application software at high speed (col. 5, lines 34-37). The Examiner asserts that this basic structure in Nagoshi et al., which is asserted to correspond to the architecture of the present invention in Fig. 1, operates to provide to Iwasaki the several missing limitations in claim 1.

Failure to Provide Missing Limitations

Applicants respectfully submit that in light of the incompatibility noted above and the substantially different processing that is conducted in Nagoshi et al, the elements missing from Iwasaki cannot be supplied by Nagoshi et al.

Light Source Position Acquisition Means

As to this first limitation that is admitted to be missing from Iwasaki, the Examiner asserts at page 4 of the Office Action that in Nagoshi et al there is a light source position acquisition means that determines a position relationship with a light source located within a camera view, as disclosed at col. 7, lines 55-56.

Even if a light source position is acquired in Nagoshi et al, Applicants would submit that there is nothing at the cited location that would lead one skilled in the art to apply a light source position to Iwasaki, as none is needed in that system.

Viewpoint Position and Viewpoint Direction Acquisition Means

As to this second limitation that is admitted to be missing from Iwasaki, the Examiner asserts at page 4 of the Office Action that, a viewpoint position 21 is illustrated in Fig. 3, which shows the letter "A" as indicating a unit vector on a line linking a camera position and a light source (col. 7, lines 37-38). The Examiner also asserts that the CPU 101 provides a viewpoint direction acquisition means for determining to what extent the camera is facing the direction of the light source, with reference to col. 7, lines 54-55.

Even if a viewpoint position and direction is acquired in Nagoshi et al, Applicants would submit that there is nothing at the cited location that would lead one skilled in the art to apply a viewpoint position and direction to Iwasaki, as none is needed in that system.

Highlight Position Calculation Means

Applicants have previously identified differences between the claimed invention and the prior art with respect to the highlight position calculation means. Notwithstanding the Examiner's failure to accept these arguments, Applicants reassert these arguments, incorporating them by reference.

Also, in the present Office Action, the Examiner asserts that Iwasaki discloses highlight position calculation means of the present invention. The Examiner also asserts that one skilled in the art would easily combine Iwasaki and Nagoshi et al and obtain the present invention. However, based on the following additional reasons, Applicants respectfully submit that as to this key limitation, the Examiner's arguments are not correct due to differences between the invention and the prior art and differences between the two references and the claimed invention.

(i) Differences Between the Invention and Iwasaki

First, in Iwasaki, an area pasted onto a reflection polygon (a predetermined polygon constituting a car object) is determined from a reflection texture image that is lager than the reflection polygon in accordance with the position of the car object in a course coordinate system (Fig.12-15). Then, reflective light of a road lamp which is reflected on the car object is expressed

by pasting the image in this area onto the reflection polygon as a texture (Fig.16). In view of this, Applicants respectfully submit that Iwasaki is different from the highlight position calculation means in the present invention in the following points:

- Iwasaki determines the area to be pasted to polygon out of the reflection texture image.

  On the other hand, the present invention calculates a position in the virtual three-dimensional space of an image representing a highlight.

- Iwasaki determines the position of the area simply in accordance with the position of the car object. On the other hand, the present invention calculates , the highlight position is calculated based on the viewpoint position.

Additionally, the Examiner states that the highlight position calculation means in the present invention is disclosed in column 7, lines 10-21 in Iwasaki. However, "position" described in column 7, line 17 in Iwasaki does not mean the position of the highlight.

(ii) Difference Between References

Second, as stated above, in Iwasaki, the position of the area in the reflection texture image is calculated. On the other hand, Nagoshi et al calculates a position of a flare polygon on a plane of projection which corresponds to a screen of a television monitor. In this manner, the approach to determine the position of the highlight differs substantially between Iwasaki and Nagoshi et al. and therefore there is no suggestion or motivation for combining Iwasaki and Nagoshi et al.

(iii) Differences Between Invention and Combination

In addition, both Iwasaki and Nagoshi et al. are different from the present invention in which highlight position calculation means calculate the position in the virtual three-dimensional space. Accordingly, the combination of Iwasaki and Nagoshi et al. will not lead to the present invention.

Thus, this express claim limitation is not found in either reference.

Highlight Intensity Calculation Means

As to this third limitation that the Examiner admits is missing from Iwasaki, at page 4 of the Office Action, the Examiner refers to Fig. 3 of Nagoshi et al. The Examiner notes that the unit vectors A and B, which depend on light source position and viewing direction, form an angle theta and are used to calculate an inner product C, whose value represents a direction of a light source to the camera lens, with reference to the disclosures at col. 7, lines 40-41 and 65-66. The Examiner notes that as the value C is higher, stronger flares are generated. Nagoshi et al also illustrates in Figs. 7A and 7B a relationship between intensity of light source and flare degree C, as well as the angle between elements A and B. Thus, the Examiner finds in these teachings a highlight intensity calculation means, which calculates an intensity of the flare based upon light source position and viewing direction.

Even if a highlight intensity is calculated in Nagoshi et al, Applicants would submit that there is nothing at the cited location that would lead one skilled in the art to apply a highlight intensity calculation to Iwasaki without the impermissible use of hindsight, as none is needed in that system.

Semitransparent Composition Means

With regard to the fourth limitation that the Examiner admits is missing from Iwasaki, at page 4 of the Office Action, the Examiner asserts that Nagoshi et al teaches a semitransparent composition means, based upon the use of a transparency D that is in proportion to the value C, particularly step S114 in Fig. 2, as disclosed at col. 8, lines 32-33 of Nagoshi et al. The Examiner observes that if the transparency D is semitransparent, half of the luminance of a ground picture is added to half of the luminance of the flare polygon, and the results of addition are drawn on the frame buffer, thereby obtaining a flare picture, as identified in step S118 and illustrated in Fig. 2 and disclosed at col. 8, lines 38-42.

The claim limitation requires the calculation of a semitransparent composition rate, corresponding to intensity. The Examiner asserts that such rate corresponds to the transparency D proportional to the inner product C, as calculated from vectors A and B in which vector A

corresponds to an incident light having a direction and size (or strength of light), as disclosed at col. 8, lines 7-8. The Examiner asserts that this corresponds to the intensity calculated by the highlight intensity calculation means.

As previously asserted, the semitransparent composition means in claim 1 is used to perform semitransparent composition of an image representing the highlight onto an image representing the opaque object. In the process as disclosed at col. 8, line 38, the luminance of a flare and a ground picture are added and the results drawn on a frame buffer. Even if the use of flare polygons having a transparency factor D in Nagoshi et al. corresponds to this means, there is no teaching or suggestion as to how or why it would be applied to Iwasaki, since Iwasaki does not use transparency. Iwasaki does use a translucency attribute in connection with the second data division to specify whether a texture image is to be pasted onto a translucency polygon in a form that allows a texture image to be seen through the translucent image, as explained at col. 7, lines 10-32. This is a different feature from that of Nagoshi, where there is no separate polygon with pasted texture. Thus, the two references would not be combinable without the impermissible use of hindsight.

Image Display Means

The claim limitation requires a display of an image obtained by performing semitransparent composition representing the highlight onto the image representing the opaque object. In Fig. 1, the TV picture receiver that provides an image display means will display the flare picture obtained from the semitransparent composition means.

Improper Use of Hindsight

As already suggested for individual limitations, resolving the significant differences between the basic operation and individual features of structures that the Examiner asserts corresponds to the claimed invention would require an impermissible use of hindsight. Further, the Examiner's own admission that five limitations are not found in the primary reference to Iwasaki and the need to look to a completely different design found in Nagoshi et al on its face

requires the use of hindsight. There is no teaching, suggestion or motivation for making the modification of Iwasaki on the basis of the different system in Nagoshi et al.

Claims 2 and 3

With respect to claim 2 and 3, the Examiner admits that Iwasaki does not expressly disclose calculating the position of the highlight based on the viewpoint position, viewpoint direction and light source position.

The Examiner looks to Nagoshi et al for disclosure of a system where a line linking the camera position with the light source object is converted into a line E on a two-dimensional screen in a route for the ray in a screen picture is specified at step S116. The Examiner observes that flare polygons having the transparency D are drawn at appropriate positions along the line E, with reference to col. 8, lines 34-38 and that the flare positions are based on the viewpoint position, viewpoint direction, and light source position because line E is formed by the camera position and direction with respect to light source position.

The Examiner asserts that the two references are analogous and that at the time of the invention it would have been obvious to combine the teachings of calculating the position of the highlight based on viewpoint position, viewing direction and viewpoint position and light source position as taught by Nagoshi et al with Iwasaki because this would calculate the position of a highlight dependent on the viewpoint position, viewpoint direction and light source position.

As previously noted, in Nagoshi et al., a line linking the camera position with the light source object is converted into a line E on a two-dimensional screen and the line E is a route of the ray in a screen picture. _Further, flare polygons are drawn at appropriate positions along the line E. Accordingly, the position of the flare calculated in Nagoshi et al is the position on the 2-dimensional screen. By contrast, the position of the image representing highlight caused by the reflection of the light from the light source appearing on the surface of the object is in virtual three-dimensional space.

As also noted, there is no teaching in Iwasaki that viewpoint position, viewpoint direction and light source position is of any significance to the generation of an object with a reflection polygon, as in Iwasaki.

Further, the approach taken by Iwasaki is significantly different from that in Nagoshi et al, such that the manner in which such features would be applied to Iwasaki would require the impermissible use of hindsight.

Claim 4

With respect to claim 4, the Examiner admits that Iwasaki does not expressly disclose calculating the intensity of the highlight based on the viewing direction and the direction connecting two of the light source position, viewpoint position and highlight position. The Examiner observes that Nagoshi et al, which deals with displaying lighting effects, discloses a system wherein the unit vectors A and B in Fig. 3 form an angle θ when they use to calculate an inner product C on the basis of the previous analysis.

The Examiner finds the two references to be analogous and combinable.

Again, there is no teaching in Iwasaki that viewpoint position, viewpoint direction and light source position is of any significance to the generation of an object with a reflection polygon, as in Iwasaki. Further, the approach taken by Iwasaki is significantly different from that in Nagoshi et al, such that the manner in which such features would be applied to Iwasaki would require the impermissible use of hindsight.

Claims 5 and 6

With respect to claim 5, the Examiner finds Iwasaki discloses a method executed by the system of claim 1 and would be rejectable on the basis of the previously stated analysis. With respect to claim 6, the Examiner finds that Iwasaki discloses an information storage medium for storing the program and would be rejectable on the basis of claim 1.

In reply, Applicant respectfully submits that the claims would be patentable for the same reasons given for claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Alan J. Kasper/

Alan J. Kasper
Registration No. 25,426

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: January 31, 2007